



NOvA Test Beam Plan Overview

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In partnership with:



Introduction

- These notes are based mainly on a preliminary report of the NOvA Testbeam Proposal Task Force
 - Karol Lang, Jeff Nelson, Ryan Nichol, Alex Sousa (Chair)
- The Task Force solicited input from people
 - involved in NOvA installation and commissioning tasks
 - Rick Tesarek, Louise Suter, Xuebing Bu, Ting Miao
 - FTBF
 - Mandy Rominsky, JJ Schmidt
 - Members of ND/TSD
 - Donatella Toretta
 - PPD Engineers
 - Jim Kilmer, Russ Rucinski, Erik Voirin
 - Safety
 - Jim Priest

Goals

- Provide absolute calibration beyond that from stopping cosmic muons
 - Nonlinearity of scintillator response (Birks' law)
 - Nonlinearity due to Cerenkov light contribution
- Tune/Validate simulation of detector response
 - Total energy response
 - Topological features
 - vs particle type, energy
 - Angle effects
- Accumulate library of data events for algorithm training

Overview

- The main test beam detector for NOvA would consist of two blocks that were built by the NOvA Project:
 - Each 31 layers, by 2 modules x 2 modules wide.
 - ~2.6 m x 2.6 m x 3.7m total, ~4000 cells
 - 28 tons
 - 124 APDs/FEBs
- Beam - MC7
 - Based on beam energy and available space
- Run Plan
 - ~5 months with electrons, muons, pions, and protons
 - Exact mix TBD

TBD

- The timeframe is not yet well-defined
 - Availability of test beam space
- The scope of work and responsibility for it is not completely specified.
 - E.g., fire safety work, rearranging beam components.
- Presumably to be settled in discussions amongst divisions, FTBF management, other stakeholders

Schedule Overview - Months from T_0 TBD

- *This is a very rough schedule that based on initial conversations with engineers*
- Deployment of Detector – T_0
 - 1 – Transportation, rigging, install oil filling infrastructure
 - 2 – 5 – Install APD cooling and dry gas infrastructure
- Outfitting of Detector
 - 2 – 3 – Install cabling, DCMs, FEBs, APDs
 - 5 – 6 – Commission detector
 - 6 – 7 – Tune beamline, commission detector with beam
- 8 – 12 – Take Data

Scope of Work - Overview

Fermilab

- MC7 Preparation
 - Removal of MIPP, Beamline Work, Fire Safety
- Deployment of detector in MC7
 - Including secondary containment, oil filling infrastructure
 - Construction and Installation of NOvA Dry Gas and Cooling Water Systems
- Installation of APDs and FEBs

NOvA Collaboration

- Detector outfitting (other than APD/FEB) and filling
- DAQ Commissioning
- Commissioning and operation

More details follow

Preparation of MC7 - Fermilab

- Removal of MIPP components
 - EM Calorimeter, RICH counter
- Beamline
 - Extend secondary beam line extension past LArlAT
 - Move tertiary beam components (currently serving LArlAT) to MC7
 - Requires engineering and construction of stand to raise beam level
- Fire safety
 - Installation of water mist fire-suppression system
 - Installation of upstream firewall

NOvA Detector Deployment and Instrumentation

- Detector Deployment in MC7 - Fermilab
 - Installation of secondary oil containment vessel
 - Reuse exiting NDOS vessel to the extent possible
 - Transportation of NOvA blocks from MINOS SB to MC7 and installation
 - Installation of oil filling infrastructure
 - Re-use equipment from Near Detector
- Detector Instrumentation
 - Oil Filling – 2 to 4 collaborators
 - APD/FEB installation – PPD Tech, 40 hours with 100% contingency
 - Collaborators will install (with minor tech labor)
 - Cable trays, cable, power distribution boxes, DCMs

Detector Commissioning and Operation

- DAQ Commissioning
 - The NOvA DAQ group will commission, as it has 4 other instances
 - NDOS, NSBAPD Test Stand, FarDet, NearDet
 - Will provide good training for DAQ experts – including possible ND/TSD personnel
 - Reuse NDOS computing Hardware, with \$6k for new disks
- Detector Commissioning and Operations
 - Collaborator effort – excellent training opportunity for young physicists
 - Expect ~2 weeks commissioning pre-beam, 2 weeks with beam
 - 5 months data taking run, staffed by collaborators
 - Including possible ~week rigging effort for changing incident angle

Caveats

- Schedule
 - Our original schedule called for work starting Feb. 2017, with taking in Jan – June 2018.
 - Mandy Rominsky had advised that access to MC7 starting ~June 2018 is more likely
 - We would need to compress the schedule to have results integrated into NOvA analysis by 2020
- Costs
 - These are early estimates
 - Some of the work in MC7 isn't NOvA-specific, but responsibility not yet established
 - Scope of beamline work could change depending on LArIAT plans
 - Fire suppression cost broken out as separate mix of M&S and SWF

SWF

Item	Type	Amount (Weeks)
MC7 Changes	Technician	24
MC7 Changes	Engineer	10
FEB/APD installation	Technician	1
Cooling water/dry gas	Technician	20
Cooling water/dry gas	Engineer	8
Decommissioning	Technician	0
Decommissioning	Engineer	0
Transport & Rigging, Racks	Technician	3
Oil Filling Hookups	Technician	2
Survey	Surveyor	1
Reinstall NDOS DAQ cluster nodes	Computing Professional	1

Technician 50
 Engineer 18
 Computing Professional 1
 Surveyor 1
 Grand Total 70

M&S

Item	Cost (k\$)
Disks for refurbished NDOS DAQ cluster	6
Dry Gas, Cooling Water infrastructure	73
Fire Safety Modificiations	100
Total	179

Note: Fire Safety includes SWF